REMARKS

By the present amendment and response, independent claims 24, 31, and 37 have been amended to overcome the Examiner's objections. Claims 24-26 and 28-48 are pending in the present application. Reconsideration and allowance of pending claims 24-26 and 28-48 in view of the following remarks are requested.

The Examiner has rejected claims 24-26 and 28-48 under 35 USC §103(a) as being unpatentable over U.S. patent number 6,069,397 to Cornett et al. ("Cornett") in view of U.S. patent number 5,446,311 to Ewen et al. ("Ewen"). For the reasons discussed below, Applicant respectfully submits that the present invention, as defined by amended independent claims 24, 31, and 37, is patentably distinguishable over Cornett, Ewen, or any combination thereof.

The present invention, as defined by amended independent claims 24 and 37, respectively, teaches, among other things, a conductor or inductor patterned in a "second area" of a dielectric, where a permeability conversion material is interspersed within the second area of the dielectric such that the permeability of the second area of the dielectric is higher than the permeability of a "first area" of the dielectric, and where the permeability conversion material is not situated underneath the conductor or inductor. Thus, as disclosed in the present application, the permeability conversion material increases the permeability of the second area of the dielectric. As disclosed in the present application, "interspersing" is defined as the collective process of implantation, sputtering, or any other process used to introduce high permeability material into the

dielectric material which surrounds an inductor. See, for example, page 12, lines 8-11 of the present application. Thus, through "interspersing," a high permeability material is introduced into a dielectric material that already surrounds an inductor. In other words, a high permeability material is "interspersed" into the dielectric material after the dielectric material and the inductor have been fabricated. Since the high permeability material is "interspersed" into the dielectric material after the dielectric material and the inductor have been fabricated, the high permeability material is prevented from being situated underneath the inductor.

By interspersing the permeability conversion material within the second area of the dielectric, the amount of permeability conversion material can be controlled to achieve a desired increase in the permeability of the second area of the dielectric after patterning of an inductor in the second area of the dielectric. For example, a small amount of very high permeability material, such as a nickel-iron alloy, interspersed within the second area of the dielectric can result in a significant increase in the permeability of the second area of the dielectric.

Additionally, increasing the permeability of an area of a dielectric by interspersing permeability conversion material within the dielectric area advantageously allows control over the particular area of the dielectric in which the permeability conversion material is dispersed. For example, the permeability conversion material may be dispersed only in an area of the dielectric that includes an inductor, and not in a neighboring dielectric area, which is situated in the same dielectric layer that includes the area of the dielectric

receiving the dispersed permeability conversion material. Thus, the present invention advantageously allows a choice of increasing the permeability of an area of a dielectric after fabrication of an inductor in that area of the dielectric, while not increasing the permeability of an adjacent area of the dielectric.

In contrast, Cornett and Ewen do not, singly or in combination, teach, disclose, or suggest a permeability conversion material interspersed within a second area of a dielectric including an inductor or conductor, such that the permeability of the second area of the dielectric is higher than the permeability of a first area of the dielectric, where the permeability conversion material is not situated underneath the inductor or conductor. Cornett specifically discloses inductor layer 220 implemented as a layer of integrated circuit 200. See, for example, Cornett, column 2, lines 17-18. Inductor layer 220 includes patterned conductive trace 110, i.e. an inductor, and is formed by depositing a first layer of magnetic material, i.e. magnetic material layer 221, on passivation layer 217. Conductive trace 110 is then patterned on magnetic material layer 221 and a second layer of magnetic material, i.e. magnetic material layer 223, is disposed on both patterned conductive trace 110, i.e. an inductor, and magnetic material layer 221. See, for example, Cornett, column 2, lines 43-48.

In Cornett, magnetic material layer 221 already comprises electrically non-conductive magnetic material when conductive trace 110, i.e. an inductor, is patterned on magnetic layer 221. As a result, the electrically non-conductive magnetic material in magnetic material layer 221 must be situated underneath conductive trace 110. In

Cornett, a second layer of magnetic material, i.e. magnetic material layer 223, is then formed over conductive trace 110 to complete formation of inductor layer 220.

Thus, in Cornett, an inductor, i.e. conductive trace 110, must be sandwiched between two layers of magnetic material, i.e. magnetic material layers 221 and 223. Thus, patterned conductive trace 110 is not first surrounded by a dielectric layer that subsequently has its (the dielectric layer) permeability increased by having a permeability conversion material interspersed into the dielectric layer. In fact, Cornett does not teach, disclose, or suggest any permeability conversion material that is interspersed within a dielectric area to increase the permeability of the dielectric area that includes an inductor. For the foregoing reasons, Applicant respectfully submits that the present invention, as defined by amended independent claims 24 and 37, is not suggested, disclosed, or taught by Cornett.

The Examiner has stated that Ewen has been cited to teach that a conventional passivation/dielectric layer comprises silicon oxide and thus, it would have been obvious to use a dielectric layer, i.e. dielectric layer 2 in Figure 3 of Ewen, comprising silicon oxide in Cornett in order to insulate the device with a conventional insulating material. In the interest of completeness, Applicant respectfully submits that amended independent claims 24 and 37 are distinguishable over Ewen. As discussed above, the present invention, as defined by amended independent claims 24 and 37, teaches, among other things, a permeability conversion material that is "interspersed" within a second area of a dielectric including an inductor or conductor, such that the permeability of the second

area of the dielectric is higher than the permeability of a first area of the dielectric, where the permeability conversion material is not situated underneath the inductor or conductor.

In contrast, Ewen specifically discloses a spiral inductor structure having three levels of metal connected by vias. See, for example, Ewen, column 2, lines 11-28. Each metal level is, in turn, situated on a layer of silicon oxide to isolate the metal levels. See, for example, Ewen, column 2, lines 14-24. In Ewen, the spiral inductor structure includes two identical spiral metal patterns connected in parallel on two different metal levels to reduce DC resistance. See, for example, Ewen, column 2, lines 26-31. However, Ewen does not teach, disclose, or suggest an increased permeability of any of the silicon oxide layers resulting form interspersion of permeability conversion material within the silicon oxide layer. In fact, Ewen does not teach, disclose, or suggest increasing the permeability of any of the silicon oxide layer in any manner.

For the foregoing reasons, Applicant respectfully submits that the present invention as defined by amended independent claims 24 and 37 is not suggested, disclosed, or taught by Ewen, either singly, or in combination with Cornett. As discussed above, amended independent claims 24 and 37 are patentably distinguishable over Cornett and Ewen and, as such, claims 25 and 26 and claims 28-30 depending from amended independent claim 24 and claims 38-48 depending from amended independent claim 37 are, *a fortiori*, also patentably distinguishable over Cornett and Ewen for at least the reasons presented above and also for additional limitations contained in each dependent claim.

The present invention, as defined by amended independent claim 31, teaches, among other things, an inductor patterned in a dielectric having a first permeability and a permeability conversion material having a second permeability interspersed within the dielectric, where the second permeability is greater than the first permeability, and where the permeability conversion material is not situated underneath the inductor. Thus, as discussed above, the permeability conversion material is interspersed within the dielectric to increase the permeability of the dielectric.

The fact that a permeability conversion material is interspersed within a dielectric, where the permeability of the permeability conversion material is greater than the permeability of the dielectric, where the dielectric surrounds the inductor prior to receiving interspersed permeability conversion material, and where the permeability conversion material is not situated underneath the inductor, results in the various advantages discussed above. As such, and based on the foregoing reasons in relation to amended independent claims 24 and 37, amended independent claim 31 is patentably distinguishable over Cornett and Ewen, either singly or in combination. Thus, claims 32-36 depending from amended independent claim 31 are also patentably distinguishable over Cornett and Ewen.

Based on the foregoing reasons, the present invention, as defined by independent claims 24, 31, and 37 and claims depending therefrom, is patentably distinguishable over the art cited by the Examiner. Thus, claims 24-26 and 28-48 pending in the present application are patentably distinguishable over the art cited by the Examiner. As such, and for all the foregoing reasons, an early allowance of claims 24-26 and 28-48 pending in the present application is respectfully requested.

Respectfully Submitted,
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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

Claims 24, 31, and 37 have been amended as follows:

24. (Twice Amended) A structure in a semiconductor chip, said structure comprising:

a first area of a dielectric, said first area of said dielectric having a first permeability;

a second area of said dielectric, said second area of said dielectric having a second permeability, said second permeability being higher than said first permeability;

a permeability conversion material interspersed within said second area of said dielectric, said permeability conversion material having a third permeability, said third permeability being greater than said first and said second permeabilities;

a conductor patterned in said second area of said dielectric, said permeability conversion material not being situated underneath said conductor.

31. (Once Amended) A structure in a semiconductor chip, said structure comprising:

a dielectric having a first permeability;

a permeability conversion material having a second permeability, said permeability conversion material being interspersed within said dielectric, wherein said second permeability is greater than said first permeability;

an inductor comprising a conductor patterned within said dielectric, said conductor having first and second terminals, said first and second terminals of said conductor being respectively first and second terminals of said inductor, said permeability conversion material not being situated underneath said inductor.

37. (Once Amended) A semiconductor chip comprising:

a first dielectric area having a first permeability;

a second dielectric area having a permeability conversion material interspersed therein such that a permeability of said second dielectric area is higher than said first permeability;

an inductor patterned in said second dielectric area, said inductor having first and second connection terminals, said first and second connection terminals being capable of providing connection to a device fabricated in said first dielectric area of said semiconductor chip, said permeability conversion material not being situated underneath said inductor.